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THE HYBRID RAGWEED, *AMBROSIA ARTEMISIIFOLIA* × *TRIFIDA*

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One of the more striking of all weed hybrids is certainly the cross between the "common ragweed" and the "giant ragweed"—*Ambrosia artemisiifolia* × *trifida*. The parents differ strongly in habit, stature, leaf-form, and fruits, producing in their cross a distinctive plant. During recent studies of the parental species I have encountered occasional naturally occurring examples of this rare cross, and I wish to report here some observations not previously recorded.

The hybrid between our two most pernicious of hayfever weeds was first discovered and described by Wylie in 1915. Subsequent authors for the most part seem not to have noticed this early paper. A single plant was found during the summer of 1914 on a roadside about 2 miles north of Iowa City, Iowa. It produced flowers in abundance but no seeds were formed, although Wylie observed the plant closely until autumn. It is significant that none of the later writers has reported seeds (or fruits) either. The leaves of the new hybrid were described as "distinctly different from either of the supposed parents, though intermediate between them in a general way," and one of the leaves was figured (op. cit., pl. 21) together with comparable leaves of the parents.

Since Wylie's original description, various observations on *Ambrosia artemisiifolia* × *trifida*, both from North America and Europe, have been published. However, in his revision of

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Ambrosia in *North American Flora* Rydberg in 1922 did not mention Wylie's plant, including only another hybrid ragweed, *A. bidentata* × *trifida*. K. L. Jones (1943) did cite Wylie's original report and also recorded another example of the wild hybrid which was found in 1936 along the banks of the Huron River near Ann Arbor, Michigan. Jones, in genetic experiments, also created the hybrid under artificial conditions by growing the all-pistillate form of *A. artemisiifolia* together with pollinating plants of *A. trifida*. Of the seven hybrid plants that he secured, two inherited the all-pistillate condition of the *artemisiifolia* female parent, four were intergrades, and one was normally monoecious. In cytological studies of the cross, he determined that the 12 chromosomes in the haploid set of *A. trifida* are recognizably larger than the 18 from *A. artemisiifolia*. Chromosome pairing was found to be irregular and there were numerous univalents. Such pairing as occurred involved almost entirely chromosomes of similar size and therefore were assumed to have been contributed by the same parent. Stebbins (1945) called attention to this as a striking example of pairing between chromosomes contributed by the same parent in species hybrids involving polyploidy.

Rouleau in 1944 redescribed *Ambrosia artemisiifolia* × *trifida* on the basis of a collection made in Canada in 1935, and gave it the binomial "× *Ambrosia Helenae*," in honor of Hélène Boulé, for whom Ile Sainte-Hélène, where the hybrid was discovered near Montreal, was also named. In 1939, Ballais found the cross at Cauderan (Giroude), France, where the parent species have been introduced (Lawalrée, 1947). In 1950 the intermediate was taken at Urbana, Champaign Co., Illinois, by Marilyn L. Briggs (Jones and Fuller, 1955).

Although we now have records in our notes only from Iowa, Illinois, Oklahoma, Michigan, Quebec, and France, *Ambrosia artemisiifolia* × *trifida* will probably be detected from time to time wherever the two parents grow together in ruderal habitats. In Michigan, as mentioned previously (Wagner & Beals, 1958), this ragweed cross is extremely rare. Such few specimens as we have found during 1956, 1957, and 1958 have been in much disturbed habitats, along the sides of newly built roads and on construction sites in and around Ann Arbor.

Despite its somewhat unique appearance the hybrid may be passed unnoticed, or may even be confused with other species. There are probably unrecognized specimens in various herbaria. To illustrate, in the herbarium of Tulane University I found in 1958 an example of this ragweed cross from Pawnee, Oklahoma (August, 1933, *C. F. Coffman*) that was identified as *Ambrosia psilostachya*, the "perennial" or "western ragweed." Another specimen reported for the first time here was found in 1957 in the much-used herbarium of the University of Michigan Biological Station. The latter (East Cheboygan, Michigan, July 30, 1933, *J. H. Ehlers 5346*) bore the identification *A. artemisiifolia*, probably because on casual inspection it appeared like a very coarse individual of the common ragweed.

Part of the difficulty of recognizing *A. artemisiifolia* \times *trifida* surely results from the rather extraordinary variation in the successive leaves produced from spring through fall. The earlier leaves of the season are roughly like over-sized leaves of *A. artemisiifolia*, but the later leaves formed on the main and lateral axes are not comparable directly to those of either parent, having rather large, but narrowly three-lobed or simple blades. By late summer and fall, all the spring leaves have normally fallen or completely dried up so that only the more simple leaf types of the distal parts of the plant remain. At this stage the plant looks something like a narrow-leaved form of *A. trifida*.

To attempt to show all the normal foliar variations of this hybrid I decided to make observations of a single, as nearly average as possible, plant—from cotyledons to highest bract. To accomplish this it was necessary to find a natural hybrid very early in its growth, so that all the first leaves would be present and intact. On May 18, 1958, a specimen was found growing with the parents on a construction site at the University Hospital, Ann Arbor. With the assistance of Dr. John M. Sheldon this plant was extracted from a difficult position in a crack along the sidewalk with as little injury as possible, and it was turned over for cultivation to Mr. Walter F. Kleinschmidt, Superintendent of the U. M. Botanical Gardens, who kept it under approximately normal conditions. A sample leaf was removed from each node just before it dried and fell off naturally. The plant grew to 50 inches in height and seemed to be of fairly

average growth for this cross in Michigan, neither as small as Ehlers' specimen from Cheboygan, nor as large as the giant specimen grown under more luxuriant artificial conditions the previous year. The results from this "pruning" of the old leaves of successive nodes are shown in Figure 1.

The seedlings of the parent species have been described by Rowlee (1893) and Kummer (1951). In over-all stature the hybrid seedling is closer to *A. trifida* than *A. artemisiifolia*. The cotyledons and the first foliage leaves of the cross are readily distinguishable from the corresponding leaves of *A. trifida*. On the fourth to eighth nodes the leaves look somewhat like extremely gross leaves of *A. artemisiifolia* and their margins are lobed and toothed (fig. 1, especially the second row). This is the leaf type depicted by Wylie (op. cit., pl. 21). By the time the sixth pair of foliage leaves has appeared, there are already lateral branches growing from all except the lowermost nodes, a feature especially characteristic of *A. artemisiifolia* (Rowlee, op. cit.). At approximately the middle level of the plant, the opposite leaf arrangement gives way to alternate, in this respect also as in *A. artemisiifolia* rather than *A. trifida* which has opposite branching throughout. The leaves in the upper half of the plant tend to be progressively simpler in structure and finally, in the top five nodes, to become narrowly three-lobed to nearly simple, the margins now practically entire. The leaves illustrated by K. L. Jones (op. cit., figs. 2, 4, 5) are like the intermediate types found in the middle of the plant (fig. 1, third row).

The leaves produced on the lateral branches of this "average" hybrid are considerably smaller than those along the main axis. The three leaves (fig. 1, inset) from a branch at the sixth node (shown by the arrow) illustrate the most common types of leaves on the lateral branches. In extremely vigorous, large and much-branched specimens of *A. artemisiifolia* \times *trifida*, however, the lateral branches become more like the top half of the main axis of our average plant. This unusually large form is shown by the specimen of Rouleau (op. cit., fig. 3), and is represented in our collections by *Wagner 8461* (MICH) from near Ann Arbor Airport which was grown to exceptionally large size in the U. M. Botanical Gardens in 1957.

Fruits have apparently not previously been found in *Ambrosia*



FIG. 1. Leaf variations of *Ambrosia artemisiifolia* \times *trifida*. Lower left: Major branches of "average" plant 50 inches tall, showing successive nodes where leaves were removed. Silhouettes (to scale) of successive leaves arranged left to right—Bottom row, nodes 1-5; second row, nodes 6-8, third row, nodes 9-12, fourth row, nodes 13-16, top row, nodes 17-18 (18 at base of terminal spike). INSET: successive leaves from lateral branch shown by arrow in habit diagram. (Silhouettes photographed by T. F. Beals).

artemisiifolia × *trifida*, and it is possible that the production of any fruits at all is atypical. Nevertheless, our natural hybrid, cited above, that was cultured in 1957 under particularly luxuriant conditions in the greenhouse and permitted to develop into an unusually large specimen was grown side by side with numerous pollinating plants of *A. artemisiifolia*, and by the latter half of September the hybrid did produce approximately twenty fruits—these having been stimulated to form, perhaps, by the

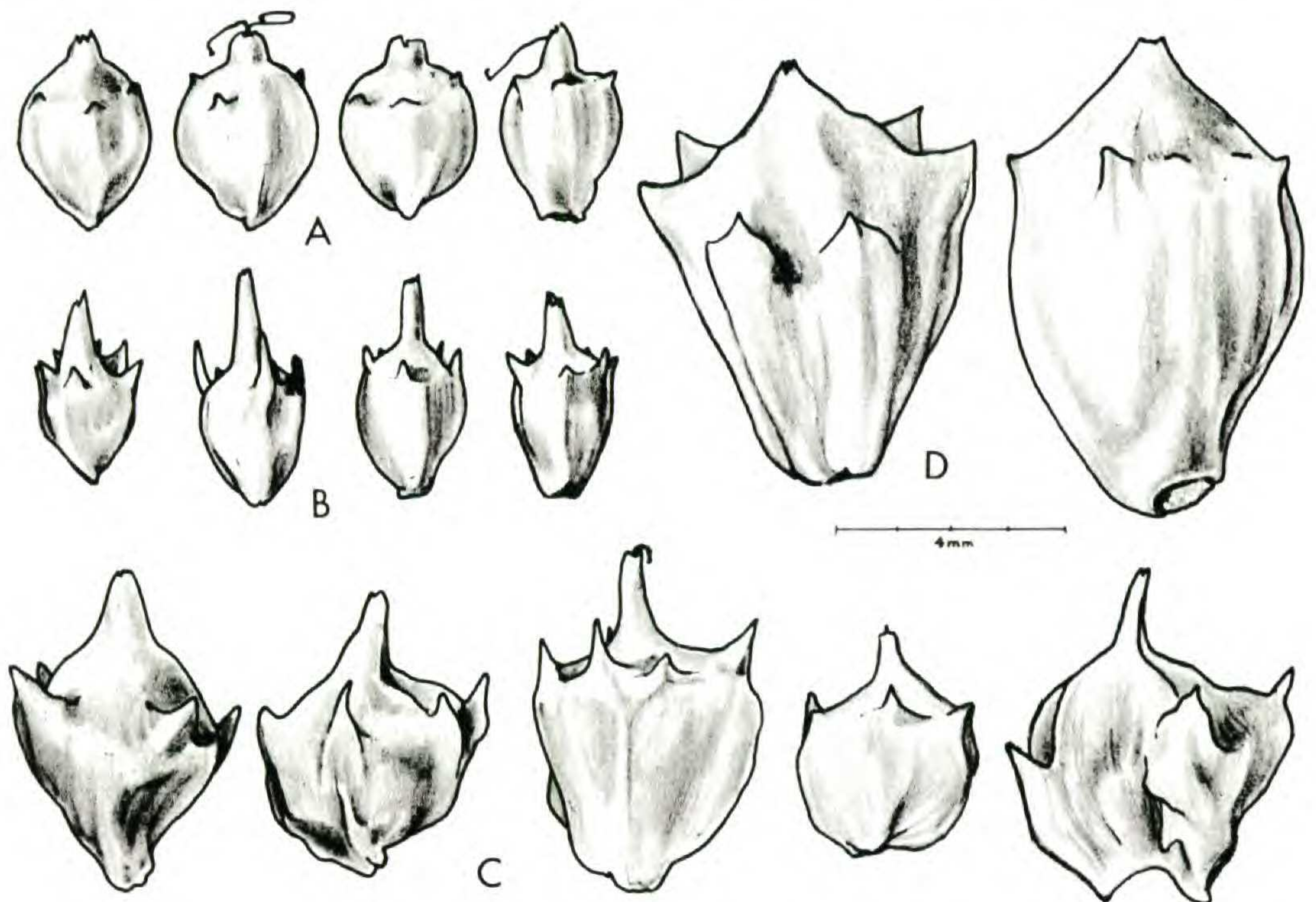


FIG. 2. Fruits of ragweeds. A. *Ambrosia coronopifolia*; B. *A. artemisiifolia*; C. *A. artemisiifolia* × *trifida*; D. *A. trifida*.

pollen from the parent species. The fruits, the outer walls of which are involueral in origin and appeared superficially to be normal, represent good intermediates between the rather different fruits of the parents as shown in the scale drawings in figure 2. The fruits of *A. artemisiifolia* average usually 4–5 mm. in total length, with a narrowly constricted beak that makes up one-third to one-half the length. Those of *A. trifida* are much larger, approximately double in over-all length, 7–10 mm., with a more broadly based beak that comprises one-fifth to one-fourth of the total length. The fruits of the hybrid are variable but all of those which did develop on the plant were intermediate both

in size and shape between those of the parents. The only major deviation is that the hybrid fruits tend to be more deeply channelled, a feature no doubt related to the collapse or failure of development of the achene within. Following after-ripening during the winter of 1957–58, an attempt was made to germinate some of the hybrid fruits, but without success. Both the pollen and the fruits (when formed) of this hybrid are probably ineffective in its reproduction.

Because of the great rarity and sporadic occurrence of this hybrid ragweed, and because of its probable inability to reproduce or even survive more than one summer by any means, I am inclined to designate it by formula only, i.e., as *Ambrosia artemisiifolia* × *trifida*, rather than by formal binomial nomenclature, as *A.* × *helenae*. There is considerably more justification, perhaps, for designating the ragweed hybrid, *A. artemisiifolia* × *coronopifolia* with a taxonomic binomial as *A.* × *intergradiens* (Wagner & Beals, op. cit.), because the latter hybrid is found to be frequent in many counties of Michigan (and probably elsewhere) and has the ability to form very large, perennial populations through the years by way of root proliferations. The question, however, of when or why it is “useful or necessary” to designate an interspecific plant hybrid with a binomial is at present wholly arbitrary and personal. It would be desirable if there existed a generally acceptable and sound philosophy as a guide in this regard.

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SOME INTERESTING RECORDS FROM EASTERN MASSACHUSETTS

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Middlesex and Norfolk Counties in eastern Massachusetts, particularly within a radius of thirty miles from downtown Boston, have been intensively explored during the past century by several generations of energetic botanists. The flora of that area is, perhaps, as well represented by herbarium specimens, and the detailed distribution of its specific elements is as well known, as that of any comparable area in the New World. It is, therefore, a source of constant interest and surprise that novelties (from a local point of view) continue to crop up in some numbers. Despite the accelerating contraction of suitable habitats for our native vegetation and the rapid conversion of rural areas to industrial, highway, and housing uses with all that that process implies, it is still profitable to rework familiar ground intensively in search of previously overlooked plants or recent arrivals.

The specimens cited below were collected by the author unless otherwise stated, and have been placed in the herbarium of the New England Botanical Club.

ISOËTES RIPARIA Engelm. Walden Pond, Concord, Middlesex County, Massachusetts, Sept. 22, 1957. Neither it nor its more northerly and hardly separable var. *canadensis* has been reported previously from the county. Even if considered as an aggregate, this species appears to be somewhat local in eastern New England: one record each from Cumberland and York Counties, Maine; one from Suffolk, three from Norfolk, and two from Worcester Counties, Massachusetts; two from Providence County, Rhode Island; two from Windham County, Connecticut.

ISOËTES MACROSPORA Dur. Walden Pond, Concord, Massachusetts, *G. R. Proctor 3681-b*, Aug. 29, 1949; same station, Sept. 22, 1957. New to Middlesex County, Massachusetts. Aside from three other stations in Massachusetts (Plymouth and Hampden Counties) this species appears to be confined to northern New England. Unaware of the Proctor collection,